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Basic Measurements

Two fundamental scientific standards of measurement, in existence for close to 40 years, have been re-determined by Dr. Walter J. Hamer of the Electrochemistry Section of the National Bureau of Standards. The achievement may go down as one of the most important in the Bureau's history.

In associated experiments, Dr. Hamer has established a new provisional standard for the faraday, the basic measurement for an electrical quantity -- and has also re-determined the atomic weight of silver.

Both measurements are of fundamental importance to chemists, physicists and to scientists in numerous other fields. Further details are expected to be available within the next few months.

Dyna-Soar Program

Air Force decision to go ahead with the program for the Dyna-Soar manned orbital space system may bring with it a new concept of program management. Interest is also being expressed in the role the National Aeronautics and Space Administration (NASA) will or will not play.

Contracts: Air Force won the right to proceed with the system over initial vigorous opposition from Dr. Herbert York, Director of Defense Research and Engineering, and others. After fostering a costly and lengthy "competition" between teams led by the Martin Co. and Boeing the Air Force failed to choose between either system. Instead, the Air Force will, in effect, take over as its own prime contractor. Other organizations, with a heavy investment in proposed subsystems, will now be required to "re-justify" their projects - although it is not yet entirely clear where the final decision will lie.

Management: Air Force, which has the vast majority of its technical know-how at the privately-owned Space Technology Laboratories, will apparently by-pass STL and rely primarily on Boeing for technical direction of the project. It remains to be seen whether Boeing will receive the authority which such responsibility entails. Some progress in this direction may come early this week when Boeing and Air Force Project officers meet at the Wright Air Development Center.

R&D News Notes

* AEC Contract Management

Atomic Energy Commission is establishing an Office of Contract Policy designed to coordinate all policies, standards and procedures pertaining to its contracts. Director of the new office will be John R. Moore, who has been supervising contracts at Oak Ridge.

Office of Contract Policy will oversee both fixed-price and cost-type contracts of the Commission, and subcontracts by the Commission's cost-type contractors. This will include contractor selection, contract negotiation and administration, fixed fees and contract reporting. Moore will also be charged with the responsibility of developing a program for keeping small business firms informed about contracting with the Commission and its contractors.

* Plowshare Program

AEC Chairman John A. McCone is going ahead with planning for Project Plowshare, the peaceful use of nuclear capabilities, despite the general agreement not to test nuclear devices. Latest step is the appointment of a 12-man committee from scientific, Government and business fields. The group is expected to advise the Commission on the "general orientation" and policies of the Plowshare program, and specific aspects of work on experimental programs. Chairman of the committee is Dr. Spofford G. English, Special Assistant to the AEC's General Manager.

* Office of Ordnance Research

It may not be as simple as it seems to win support from the Office of Ordnance Research at Durham, N. C. -- at least according to statistics. Since the Office was established in mid-1951 some 2,598 proposals have been received. A new study shows that as of June 30, 372 of these were active, 336 had been withdrawn, 131 were pending and a total of 1,204 had been declined.

* National Science Foundation

Two important changes in officialdom at the National Science Foundation: Dr. Richard H. Bolt, Director of the Acoustics Laboratory, Massachusetts Institute of Technology, becomes Associate Director for Research. Dr. Harry C. Kelly, an assistant Director for the Foundation, becomes Associate Director for Scientific Education.

* Armed Forces Inventions

No SCIENCE TRENDS reader should be without a personal copy of the stimulating, provocative and sometimes amusing list of new inventions required by the Armed Forces. Requirements range from new rocket propellants to new condiments -- some 300 in all.

(For a free copy of Inventions Required by the Armed Forces, just published, write the National Inventors Council, U.S. Department of Commerce, Washington 25, D. C.)

Hypervelocity Research - Electrical Gun

Advanced Research Projects Agency is sponsoring a program at the Naval Research Laboratory to develop and use ballistic facilities capable of accelerating small shaped projectiles to velocities in the range of 30,000 feet per second. Program has led to development of an electrical gun system and an advanced switching system applicable in other research fields.

Powder and Gas Guns: Program is designed to provide information on exterior and terminal ballistic effects, presumably for anti-ICBM, anti-satellite and space flight projects.

Modified powder guns were developed which achieved projectile velocities of close to 10,000 feet per second. More recently, a light-gas gun using helium or hydrogen was developed with which velocities of about 20,000 feet per second were achieved. However, tests indicated that maximum gas-gun velocities would be limited to below 25,000 feet per second unless major modifications were undertaken.

Electrical Gun System: Researchers have decided to exert their major efforts in the field of electrical guns. A small gun system of medium capability was built earlier this year and has been fired 10 times, with results within the expected range.

*Operation: System consists of a projectile launch barrel and gas reservoir separated by a diaphragm, a capacitor energy storage bank and an electrical coupling network. A switch is used to deliver the bank's stored energy to the gas chamber. An electrical discharge heats the contained gas and thereby increases the pressure. The diaphragm then ruptures, allowing the reservoir gas to expand and accelerate the projectile.

*Advantages: NRL researchers point out that with the electrical discharge technique the driver gas temperatures can be readily controlled and can be increased well above gas temperatures found in other type guns. System now in operation reaches a calculated 11,000 to 12,000°C., with pressures at 100,000 pounds per square inch. These temperatures, as well as low gas molecular weight, lead to very high gas molecular velocities.

*New Switch: The NRL gun has a fast discharge capacitor bank capable of storing 18,000 joules at 20,000 volts and delivering it to a noninductive load in five microseconds. A new type of low-inductance switch was designed in order to make the inductance of the gun system as low as possible. Since most of the electrical resistance and inductance of a high-current switch occurs in the relatively long air spark gap required to hold off the applied voltages, the air gap was replaced with a very short one strengthened with Mylar insulation sheet. Project leaders explain that the switch is closed by explosively rupturing the Mylar -- permitting the impressed voltage to flash over the remaining gap.

Performance of the system indicates that such methods are feasible and that performance sufficient for hypervelocity studies has been obtained. A larger electrical gun system, with a five-fold increase in energy capacity, is now on order.

(R&D by Ballistics Branch, Mechanics Division, Building 23, U. S. Naval Research Laboratory, Washington 25, D.C.)

Rocket Engine Control

Engineers at the National Aeronautics and Space Administration (NASA) Lewis Research Center, Cleveland, Ohio, have designed and tested a new control system to regulate the chamber pressure and mixture ratio of a regeneratively cooled hydrogen-fluorine rocket engine.

System was designed to increase the safety and speed of testing and to investigate the general controllability of such an engine. Test results show the system to be capable of starting the engine and providing stable operation to within two percent of the preset values of chamber pressure and mixture ratio. Device also serves to avoid a fuel-rich mixture.

In addition, researchers conclude that the control system is capable of so-called multipoint stepping of any ratio within the capability of the apparatus. The speed of response of the control-valve actuators is said to be more than adequate to meet emergency shutdown safety requirements.

(Report available. 61 pages. Single copies free. Write NASA, Code BID, 1520 H Street, N.W., Washington 25, D.C. for NASA Technical Note D-82)

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Gas-Smoke Detector

An automatic system developed by the Bureau of Ships, U.S. Navy, is said to be capable of detecting the presence of combustion gas and smoke on board ship. Device may have applications elsewhere.

System is based upon a predetector head which serves as a triggering mechanism for standard Navy alarm systems and switchboards. Device consists of two ionization chambers, one open to the atmosphere, and the other virtually inaccessible to the atmosphere.

Elements of these chambers are electrically interconnected in a manner which the Navy says provides a miniature bridge circuit that is normally balanced. The air in each of the chambers is made conductive by alpha particles emitted by minute quantities of radium located in each chamber. Current is kept to a relatively minute level of about 3/1,000,000,000 ampere.

Device goes into operation when the presence of combustion gas or smoke in the outer chamber increases the chamber's resistance, thereby unbalancing the bridge circuit and firing a cold cathode tube. This causes enough current to flow through the respective circuit to operate an alarm relay. As many detector heads as required may be connected on a circuit.

Navy is installing the system in missile magazines in its new ships such as the Boston and Canberra, and plans to include it in other ships now under construction. Since combustion gas and smoke generally precede flame in a fire, it is expected that potential damage can be greatly minimized.

Saline Water Conversion

U.S. Department of the Interior is supervising some $466,339 in research and development contracts for the conversion of sea or brackish water. Dr. A.L. Miller, Director of the Department's Office of Saline Water says that new ideas and proposals are constantly being received and evaluated. Here, for reference, are R&D contracts awarded for new or continued work since July 1:

*Battelle Memorial Institute, Columbus, Ohio: $62,540 for continuation of solar distillation developments and operation of various prototype stills; $18,000 for additional research on rotary vapor compression distillation and $11,000 for a new detailed study of corrosion of materials in hot sea water.

* Carrier Corp., Syracuse, N.Y.: $105,000 for development and experimental operation of 15,000 gallon per day pilot direct freezing plant.

*Cornell University, Ithaca, N.Y., $8,530 for continued research on direct freezing process using secondary refrigerant.

*Curtiss-Wright Corp., Princeton, N.J.: $14,327 for development and construction of improved flat tilted solar stills.

*Franklin Institute, Philadelphia: $2,355 for continued research on production of permanently hydrophilic surfaces on plastic films for solar stills.

*Georgia Institute of Technology, Atlanta: $21,190 for development and experimental evaluation of external condensation and dispersion of feed water in improving solar still yield and economy.

*Lummus Co., N.Y.: $4,000 for experiments to determine the application of atomized suspension techniques for disposal of concentrated brines.

*Dr. Donald F. Othmer, Brooklyn, N.Y.: $8,000 for continued studies of vapor heat reflash distillation system.

*Brooklyn Polytechnic Institute: $10,700 for experimental work on vapor reheat including construction and operation of a one-stage spray condenser.

*Whiting Corp., Harvey, Ill.: $80,000 for further experimental operation of a long-tube vertical distillation facility with emphasis on scale and corrosion prevention.

*Syracuse University Research Institute: $15,065 to investigate the feasibility of saline water conversion using gas hydrates.

*Ionics, Inc., Cambridge, Mass.: $50,000 to determine the conditions controlling supersaturation in natural saline water and thereby alleviate scaling in electrodialysis equipment.

*Radiation Applications Inc., N.Y.: $37,070 to synthesize, determine essential physical and chemical characteristics and test ion-restraining membranes which are essential for practical operation of the reverse osmosis conversion process.

*University of Oklahoma Research Institute, Norman Oklahoma: $18,112 for a fundamental study of electrical control of adsorptivity of porous conductors as a possible new conversion process.

Publication Checklist

( ) Basic Research in the Navy, a study by Arthur D. Little, Inc. for the Naval Research Advisory Committee which is said to "break new ground" in applying new methods for measuring basic research and for determining its value. 189 pages in two illustrated volumes. $7. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 925)

( ) IGY Reports, a study of the U.S. observations and experiments in a number of fields for the 1959 International Geophysical Cooperation program. 69 pages. $1. (Write Publications Office, National Academy of Sciences, Washington 25, D.C. for IGY General Report No. 6)

( ) Instrumentation Markets, a U.S. Government study of marketing opportunities for high precision and industrial and process instruments in the Benelux countries -- Netherlands, Belgium and Luxembourg. Prospects are said to be favorable. 10 cents. Write Publication Sales, U.S. Department of Commerce, Washington 25, D.C. for "Instrumentation in the Benelux Countries."

( ) Oceanography, statements, testimony and exhibits presented to Congress on the question of education in the field of oceanography. 37 pages. Single copies free. (Write Committee on Science and Astronautics, U.S. House of Representatives, George Washington Inn, Washington 25, D.C. for Hearing No. 43)

( ) Materials Analysis, a U.S. Government report on design, construction and operation of a fluorescent x-ray spectrographic probe which is said to provide a rapid, nondestructive method for analyzing small samples or selected areas of metallurgical and mineralogical specimens. 23 pages. Single copies free. (Write Publications-Distribution Section, U.S. Bureau of Mines,4800 Forbes Avenue, Pittsburgh 13, Pa., for Report of Investigations No. 5500)

( ) Research and Development Statistics, the proceedings of a special meeting on statistical methods and problems encountered in the analysis of research and development manpower and costs. Also includes a selected bibliography of R&D surveys and related material. 132 pages. $1.25. (Write Superintendent of Documents, Government Printing Office,Washington 25, D.C. for Publication NSF 59-36)

( ) Research and Development Implications, a new bibliography listing and reviewing books and articles dealing with the economic and social implications of research and development in the United States. 51 pages. 25 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for NSF 59-41)

( ) Aircraft Nuclear Propulsion, a critical report by an influential Congressional committee on management and progress of the nuclear airplane program. Includes a chronology of events since the project's inception in 1946. 25 pages. Single copies free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D.C. for Report - ANP Program)

( ) Krypton-Xenon, a bibliography listing 100 unclassified publications on the adsorption of krypton and zenon on activated carbon and the uses of this process in research, industry and in technical applications. Covers books, articles and papers from 1905 to 1959. 24 pages. 75 cents. (Write OTS, U.S Department of Commerce, Washington 25 D.C. for MLM 1092)